Our tunnel boring machine, Elizabeth, broke through to Stepney Green cavern in the early morning of a cold November day. Arriving at one of the largest mined caverns in Europe, the 1,000 tonne machine bored her way through earth, 40 metres below ground. Stepney Green in east London is crucial to the Crossrail project, acting as the connecting point for tunnels from the northeast and southeast.

Elizabeth, along with her sister machine Victoria, is carrying out the longest tunnel drive, which is due to be completed by the end of 2014. When finished, the tunnel will stretch from Limmo Peninsula near Canning Town to Farringdon – a distance of 8.3km (5.16 miles).

Since being launched last winter, both machines have been working round the clock to create the new tunnels, passing through the new Canary Wharf Crossrail station during the summer. After all her hard work, Elizabeth took a breather and underwent maintenance works and safety checks inside Stepney Green’s eastbound cavern before resuming tunnelling towards Whitechapel, Liverpool Street and Farringdon.

The cavern at Stepney Green is approximately 50 metres long, 17 metres wide and 15 metres high, and will play a critical role when Crossrail opens. It is where the railway will divide with the southeast spur running underground to Canary Wharf, Woolwich and on to Abbey Wood.

This is the first of four tunnel breakthroughs that will take place at Stepney Green. Following in her sister’s footsteps, Victoria is expected to come through in the New Year.
As tunnelling continues at Liverpool Street station, building the utility tunnel revealed more than 20 Roman skulls in the mud. Clusters of skulls have been located 6m below ground, indicating that they were caught in a bend of what was once the River Wallbrook, the historic Thames tributary.

The skulls were found deep below the 16th Century Bedlam burial ground, where some 3,000 skeletons have already been removed by careful archaeological excavations.

Archaeologists have confirmed these Roman skulls, which have risen out of the sediment, are likely to be from a Roman cemetery once located at Eldon Street. Close to the Wallbrook, it is believed that erosion over time has led to these skeletal remains being washed downstream and caught up in the bend.

Some experts have speculated that these skulls could be evidence of heads decapitated during an uprising by Queen Boudicca’s warriors against Roman occupation during the 1st Century AD.

“This is an unexpected and fascinating discovery that reveals another piece in the jigsaw of London’s history,” said Jay Carver, Crossrail’s lead archaeologist. “However, we think the skulls are from a known Roman burial ground 50m from our Liverpool Street station worksite. Their location indicates they were possibly washed down river during the Roman period.”

Crossrail’s contractor, the Museum of London Archaeology, will be analysing the finds over the coming months and hopes to find out more about the age, sex, and diet of these early Roman Londoners.

The tunnellers also discovered wooden medieval structures which are believed to be part of the walls of the Bedlam burial ground.

Crossrail has delivered a million tonnes of London earth to the new man-made nature reserve at Wallasea Island in Essex.

This is one of the biggest movements of earth out of central London since the Edwardian construction of the Piccadilly line. Crossrail is using rail and ship to transport 4.5 million tonnes of earth to build the new nature reserve, which avoids 200,000 lorries travelling by road to make the same deliveries.

Originally levee-protected farmland, Wallasea Island is being transformed into an inter-tidal marshland similar to its original environment some 400 years ago. More than 9,000 animals and plants (including protected reptiles, eels, orchids and water voles) have been captured ahead of construction and are being rehomed at the island.

Once completed, the island will attract tens of thousands of migratory birds, protect the area from coastal erosion and act as a carbon sink for 450 tonnes of CO\textsubscript{2} produced every year.
Our first tunnel boring machine (TBM) Phyllis completed her journey through the ground from Royal Oak to Farringdon in November.

Among the first to set foot inside the tunnel were Chief Secretary to the Treasury Danny Alexander MP and Commercial Secretary to the Treasury Lord Deighton. They met several construction workers and apprentices who have been working on the passenger tunnels under Farringdon station.

The completion of Phyllis’ 6.8 kilometre journey to Farringdon marked another milestone for our tunnelling teams, who are now over half way through their 42 kilometre tunnelling marathon.

“This first tunnel is a key milestone in the journey towards a better transport network in London,” said the Treasury Chief Secretary. “Crossrail will transform the way people travel, slashing journey times”.

Phyllis’ journey began in spring 2012 and finished in winter 2013. Hot on her heels, three other TBMs are due to reach Farringdon in the coming year.

Farringdon station will be at the heart of London’s rail network, becoming one of the busiest stations linking north, south, east and west London and three of London’s major airports. More than 140 trains an hour will pass through in each direction at peak times. Over 150,000 passengers will use the station per day.

BERMINGHAM GOES UNDER LONDON

As he approaches his 70th birthday, Crossrail tunneller Peter Bermingham will tunnel under the Thames for a record tenth time.

Peter’s career spans 50 years from when he began work in 1964 on the Victoria Line from Green Park to Oxford Circus. Since then he has worked on several projects in and around London including the Jubilee Line extension, the Olympic Park and the King’s Cross redevelopment. He has also worked in Hong Kong, Australia, Fiji, Singapore and Copenhagen. In 1992 he was awarded the British Empire Medal for services to tunnelling.

With help from Peter’s efforts as site manager, TBMs Mary and Sophia are boring the 2.6km long tunnel from Plumstead under the Thames to North Woolwich, completing in 2014.

Crossrail will provide a significant spur to regeneration in and around Woolwich and reduce journey times for passengers in southeast London. Journey times from Woolwich to Bond Street will be 15 minutes quicker and 40 minutes quicker to Heathrow.

“When I started out tunnelling back in 1964, I never thought that I’d still be in the industry almost 50 years later,” Peter said. “It’s the camaraderie and the spirit among the lads that’s kept me in the business for so long. Going under the Thames for the tenth time will feel pretty special, in particular on a project that is going to bring such benefits to the local area.”
WALES URGED TO JOIN
THE SUPPLY CHAIN GANG

Crossrail has joined forces with the Welsh Government to urge Welsh companies to seize the business opportunities that Europe’s biggest construction project has to offer.

The Welsh Government’s Economy Minister Edwina Hart AM and Crossrail Chairman Terry Morgan joined business representatives from across Wales at a Business Wales event in Cardiff, in November. Delegates were given the chance to find out how to win work on Crossrail and to hear from two of the project’s major contractors, Costain Skanska and Bam Ferrovial Kier (BFK).

As part of the event, the Economy Minister and Crossrail Chairman visited Cardiff-based company Celsa UK. The firm has provided more than 50,000 tonnes of steel to Crossrail.

Much of this steel is sent to a subsidiary company, Express Reinforcements, with depots in Cardiff, Neath and Newport. This firm manufactures steel cages to reinforce concrete, which have been used at ten Crossrail sites. The work has resulted in the creation of 80 temporary jobs and many more have been preserved.

Edwina Hart urged businesses to make the most of the potential supply chain opportunities. “The Crossrail project is a great opportunity for Welsh companies to benefit from the contracts available in this major infrastructure project,” she said.

Terry Morgan, who grew up in Cwmbran, added, “As a Welshman, I’m incredibly proud that steel produced in Cardiff is playing a significant part in the construction of London’s new rail link.

“Crossrail is not just benefitting London and the South East, it is creating jobs and business opportunities right around the UK as firms from Falmouth to Fife pick up work on the project,” he explained. “A number of companies from Wales have already won work but, as we enter peak construction, it’s vital that firms from this part of the world continue to seize the opportunities that will be on offer.”

DIVE UNDER ACTON

Work to construct a new rail underpass (dive-under) began in Acton in 2011.

Excavation of the eastern half of the dive-under is nearing completion. The western half will be constructed during 2014. In all, some 34,000 tonnes of earth will have been excavated to create the dive-under which lies to the west of Acton Main Line station.

The new dive-under will allow freight trains to access the Acton Freight Yard without affecting passenger services into central London, thereby increasing capacity and reliability.

A milestone was reached at Christmas 2013 with the track across the central bridge section (shown in picture) being connected up so that freight trains can now access the yard across the centre of the dive-under.

Rob McIntosh, Crossrail Programme Director at Network Rail, said, “The new dive-under will ensure the activities of this important freight yard.”

Network Rail is responsible for the design, development and delivery of the parts of Crossrail that are on the existing network. With the help of the new dive-under, Crossrail will transform public transport, making it quicker and easier for people to get to a range of destinations across London and the southeast. Works are expected to finish in 2016.

The Acton site team celebrates the completion of the bridge ready for the dive-under to be excavated

Welsh based Celsa UK provided Crossrail with more than 50,000 tonnes of steel

Crossrail has joined forces with the Welsh Government to urge Welsh companies to seize the business opportunities that Europe’s biggest construction project has to offer.
Crossrail wants industry to do more to attract women into engineering and construction.

Currently, women make up 19 per cent of the construction workforce and are mainly in administrative roles. Crossrail’s Central Section Delivery Director, Ailie MacAdam said the industry has a “responsibility” to encourage more women to follow an engineering and construction career path. She said the industry is missing a trick by ignoring the significant talent and failing to address gender inequality.

“As a country we are short of engineers”, Ailie MacAdam told the Gender Diversity in the UK Engineering and Construction Industry Conference, in November. “If we ignore 50 per cent of the potential workforce, we’re shooting ourselves in the foot.”

With more than 25 years of construction experience, Ailie is responsible for delivering £7.5 billion of new Crossrail infrastructure. “There is strong evidence that shows diverse teams get better results,” she added. “It is vitally important to reach out to young girls before they choose their path through education, to dispel myths, show girls that engineering is a viable option and how rewarding it can be.”

Crossrail is working to attract new talent to the construction sector and has established the £13 million Tunnelling and Underground Construction Academy (TUCA) in Ilford to provide key skills training in tunnelling and construction work.

TUCA offers graduate and apprenticeship programmes from which 260 apprentices are currently working on the Crossrail project.

SUSTAINABILITY MAKES PROGRESS

Crossrail has published its second annual sustainability report, outlining its progress in delivering a new railway for the future.

Highpoints of the year reveal Crossrail has generated training opportunities for future generations of tunnellers through the Tunnelling and Underground Construction Academy (TUCA). It has also increased employment, with 10,000 people working on Crossrail construction sites and is already well on the way to meeting its target of 400 apprenticeships over the lifetime of the project.

The economic benefits of the project have spread across the UK, the report finds, with more than 62% of businesses on Crossrail’s supply chain coming from outside London, over half of which are small and medium sized enterprises.

Crossrail is also leading the way with its environmental initiative, having delivered its one millionth tonne of excavated earth to build a new RSPB nature reserve at Wallasea Island in Essex. The island is set to be the largest man-made natural habitat of its kind in Europe.

“Our sustainability report shows how far we’ve come and that we are committed to delivering a lasting legacy beyond a sustainable railway,” Crossrail’s CEO, Andrew Wolstenholme said. “We are creating a new generation of construction workers and tunnellers with skills that will set them up for life. We are helping support business across the UK, and we are leading the industry on implementing environmental solutions to make for a greener construction sector.”

The 2013 Sustainability Report is available for download at www.crossrail.co.uk/sustainability

TUNE IN TO ROAD SAFETY

Crossrail and the Metropolitan Police’s Exchanging Places event took centre stage during Road Safety Week 2013.

The safety event at Canary Wharf saw police talking to pedestrians and cyclists about the blind spots in and around the HGVs used by Crossrail. Some had the chance to sit in an HGV and find out what a lorry driver sees. Free checks to make sure bikes are roadworthy and free registrations against theft were also offered by the Metropolitan Police.

Exchanging Places events are held in prominent places near Crossrail work sites where cyclists, pedestrians and lorry drivers alike need to be more vigilant. Twelve events were held in 2013, the latest near the Connaught Tunnel site office in Silvertown, and more are due to be held in 2014.

For details visit www.crossrail.co.uk
Deputy Prime Minister Nick Clegg MP joined young people and older visitors to get a taste of engineering in the future at the national Skills Show in November. The Deputy Prime Minister met Crossrail representatives to find out about the opportunities available for young people on one of Europe’s largest construction projects.

Held at Birmingham NEC, the Skills Show is one of the UK’s largest events. At this year’s event more than 2,000 people visited Crossrail’s stand, which featured an enormous graphic of a tunnel boring machine cutter head, some 80% of the actual size.

A further 1,000 students and young people came to visit Crossrail at the annual London skills event, Skills London. Here, they were able to see 3D footage of recent tunnelling breakthroughs at Stepney Green and Canary Wharf.

Both events provided ideal platforms for people to learn more about Crossrail and the wider opportunities in engineering and construction in the future.

Crossrail and Transport for London welcomed 140 new graduate trainees into their organisations in September 2013.

The trainees will work in areas including engineering, project management, transport planning, commercial, information management, finance and marketing roles. Applications for the 2014 schemes have now opened and a similar number of graduates are expected to be recruited.

The Crossrail Graduate Scheme offers graduates the opportunity to work alongside project management teams, contractors and designers delivering the Crossrail project. Successful applicants were recruited from courses in a range of engineering and commercial disciplines. They will join a two-year programme.

Crossrail’s CEO, Andrew Wolstenholme said, “This is a fantastic opportunity for graduates to join and play a key role in delivering Europe’s largest construction project.”